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Intergenerational relations and social mobility: Social inequality in physical function in old age

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ABSTRACT

Background: The concept of social foreground describes how adult offspring's socioeconomic resources may influence older adults' health and several studies have shown an association between socioeconomic position of adult offspring and the health of their older parents. However, little is known about the factors that generate these associations. We study 1) how adult offspring's social class is associated with physical function (PF) among older adults, 2) whether geographical closeness and contact frequency with offspring modify the association, and 3) whether intergenerational social mobility of offspring is associated with PF of older adults.
Method: Data are obtained from the 2002 (n = 621) and 2011 (n = 931) waves of the Swedish Panel Study of Living Conditions of the Oldest Old. Multivariable linear regression models were employed and adjusted for own and partner's prior social class and offspring's age and gender.
Results: Compared to offspring with non-manual occupation, offsprings with manual occupation was associated with poorer PF in older adults (−0.14, CI95%: −0.28;0.00). In stratified analyses, offspring's social class was only associated with older adults' PF among those who lived geographically close. Contact frequency between the offspring and the older adults did not modify the associations. Older adults whose offspring experienced downward intergenerational social mobility were associated with the poorest PF.
Conclusion: This study supports evidence of a relationship between social foreground and older adults' PF where geographical closeness and social mobility are important components.

1. Introduction

Life expectancy has almost doubled in the past century, which has led to increases in joint survivorship within and across generations. Prolonged periods where both adult offspring and older adults are alive have increased the time where support can be exchanged between the generations (Silverstein and Giarrusso, 2010). When older adults become dependent on care in old age e.g. due to decline in physical function (PF), adult offspring are the most common primary caregivers (Silverstein and Giarrusso, 2010). This makes adult offspring important sources of emotional and practical support, and various studies have shown that social relations are important for PF and longevity in old age (Escobar-Bravo, Puga-Gonzalez, & Martin-Baranera, 2011; Litwin & Shiovitz-Ezra, 2006; McLaughlin, Leung, & Pachana, 2012; Mendes de Leon, Gold, & Glass, 2001). However, the support that adult offspring can provide their parents may depend on their own socioeconomic resources. Recently, the concept of social foreground has been introduced, which suggests that the adult offspring's socioeconomic position (SEP) may influence the health outcomes of their older parents (Torssander, 2013). This hypothesis has been supported by a limited number of studies of late life mortality from middle and high income countries (De Neve & Harling, 2017; Friedman & Mare, 2014; Torssander, 2013, 2014; Yang, Martikainen, & Silventoinen, 2016; Zimmer, Martin, & Ofstedal, 2007), but only two studies on PF from Mexico and Taiwan (Yahirun, Sheehan, & Hayward, 2016; Zimmer, Hermalin, & Lin, 2002). No studies on the impact of the social

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foreground on PF in old age have been conducted in high income countries.

The mechanisms behind social foreground are not fully established, but have been suggested to act through transfer of both material and non-material resources. Based on Berkman and Glass' (2000) theory on how social relations impact health, Torssander (2013) suggests that social support, social influence, and access to resources are three possible pathways of how SEP of adult offspring can influence older adults' health (Berkman & Glass, 2000; Torssander, 2013). Torssander has suggested that offspring's education influence older adults' health by affecting lifestyle, use of healthcare and adherence to medical treatments of the parent (Torssander, 2014). Offspring's SEP has been suggested to influence older adults' health because stable and privileged labor market positions may provide benefits for more family members (Torssander, 2014). Also, higher SEPs provide knowledge and contacts that are important for health and navigation within the health care system (Torssander, 2014). Furthermore, flexible work hours related to certain SEPs may enable adult offspring to engage more in older adults' contact with health- and eldercare (Torssander, 2014). Finally, Torssander suggested that offspring's income may influence older adults' health through the provision of material resources and consumption potential (Torssander, 2014). Thus, specific additional resources related to different aspects of the SEP of adult offspring are suggested to support and promote older adults' health in old age.

To elucidate whether the possible mechanisms linking social foreground to late life health depend on social contact between older adults and offspring, studies should investigate whether older adults experience more health benefits from having offspring with high SEP if they have high social contact and live geographically close to the offspring. The contact frequency between adult offspring and older adults directly implies whether there is a basis for regular transfer of resources between them. Previous studies have not investigated the potentially modifying impact of social contact on the association between social foreground and health. Geographical distance between adult offspring and older adults also influence contact frequency and the possibility of face-to-face contact (Fors & Lennartsson, 2008) and, in turn, whether resources are likely to be regularly transferred between them. This would support an explanation where regular transfers of resources, from the adult offspring to the older parent, is part of the mechanisms generating health disparities by social foreground. If there is no difference between the older adults' health, depending on the geographical distance to or contact frequency with offspring, this could imply that it is the possibility to draw on resources of adult offspring with high SEP, when needed, rather than regular transfers of resources that drives the association between social foreground and health in later life.

The concept of social mobility is also important to study in relation to social foreground. Social mobility concerns the downward and upward inter-generational or intra-generational socioeconomic mobility, and have previously been investigated in relation to the individuals' own health (Hallqvist, Lynch, & Bartley, 2004; Lynch, Kaplan, & Cohen, 1994). Yet, it is possible that offspring social mobility also influences the health of their older parents. Older adults may experience a status loss if their offspring experience downward social mobility, whereas upward social mobility may lead to a feeling of status gain. On the other side, social mobility may create emotional distance between adult offspring and older adults. In a recent commentary, Simandan (2018) describes how upward social mobility among individuals from disadvantaged backgrounds can result in social isolation and subsequent negative health consequences. Individuals who experience upward mobility may lose contact with individuals from their prior SEP and negative emotions due to envy may dominate the remaining relations. At the same time, individuals who experience social mobility have to fit into their new SEP (Simandan, 2018). Therefore, intergenerational upward social mobility may lead to a stressful relation between adult offspring and their older parents, which could cause adverse health outcomes for both generations. Whether and how intergenerational social mobility of offspring influences older adults' health still needs to be investigated. Elucidation of the relation between intergenerational social mobility of offspring and parental health could explain whether social mobility leads to poorer health among older adults potentially due to generational conflicts.

The aims of this study are to investigate: 1) how adult offspring's social class is associated with PF among older adults, 2) whether geographical closeness and contact frequency with offspring modify the associations, and 3) whether intergenerational social mobility of offspring is associated with PF of older adults.

2. Methods

2.1. Data and study population

Data from the 2002 and 2011 waves of the Swedish Panel Study of Living Conditions of the Oldest Old were utilized in this study. The Regional ethical review board in Stockholm has approved study protocols (registration numbers 2010/403-31/4, and 2014/1003-31/5). The data were mainly obtained from face-to-face interviews, but proxy interviews were performed when the older persons were not able to answer themselves. Each wave comprises previous interviewed individuals from earlier waves and new enrolments to ensure that the sample represents the age distribution of the older segment of the Swedish population including community dwelling and institutionalized older adults. The participation rates were very high for both waves (2002: 84.4% and 2011: 86.2%) (Lennartsson, Agahi, & Hols-Salen, 2014).

The flow chart in Fig. 1 illustrates the selection of the study population based on 621 older adults from the 2002 wave and 931 older adults from the 2011 wave. Due to the focus on SEP status of older adults' offspring, the study was restricted to older adults with offspring.

2.1.1. Exposures

The main exposure variable was *adult offspring's social class* at the time of the survey, which was categorized using the official Swedish socioeconomic classification (SEI classification) similar to the widely used EGP-schema developed by Erikson, Goldthorpe and Portocarero (Statistiska Centralbyrån (SCB), 1982). Social class was dichotomized into the categories non-manual occupation and manual occupation (Appendix, Table S1 for details). *Adult offspring's social class* was based on the 'dominance' approach where information from the oldest offspring with the highest social class is included. The 'dominance' approach originally described that the higher social class of a household tend to be more important than lower social classes for the lifestyle in the household (Erikson, 1984). The mechanism may be similar for the impact of adult offspring's SEP. The variable was coded 0) non-manual if any of the offspring had non-manual social class and 1) manual occupation if all of the offspring had manual occupation. When older adults had more than one offspring with non-manual occupation, the oldest offspring was included.

2.1.2. Covariates

The potential confounders are specified below:

- *Older adults' own prior social class* was measured by the main prior social class and categorized as 0) non-manual and 1) manual occupation (Appendix, Table S1 for details).
- *Older adults' partner's prior social class* was defined by the main prior social class and categorized as 0) non-manual, 1) manual occupation and 2) no partner (Appendix, Table S1 for details).
- *Age of offspring* was included as a continuous variable.
- *Gender of offspring* was categorized as 0) female and 1) male.

To investigate social and geographical closeness as potential effect-

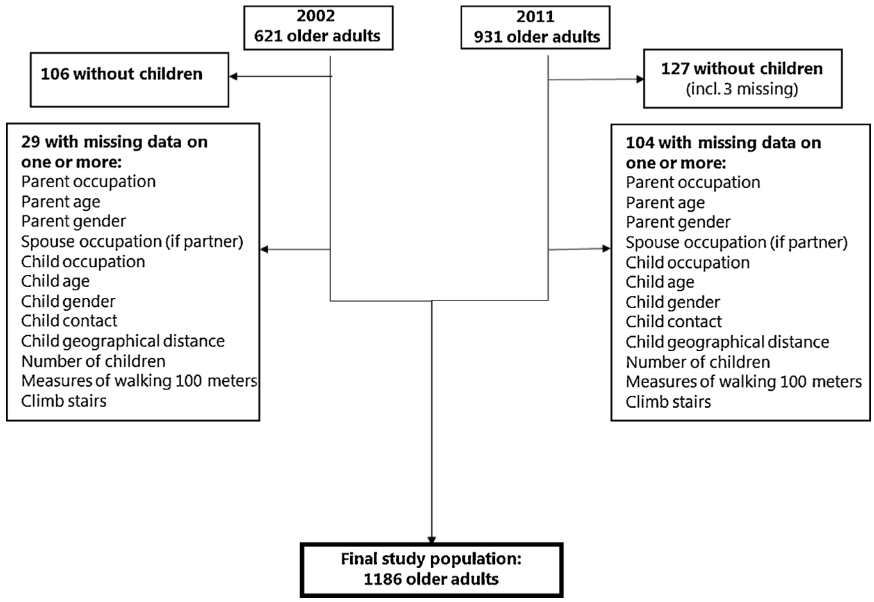

Fig. 1. Flow chart of the study population.

measure modifiers, two combined variables between offspring's social class and contact frequency and geographical closeness, respectively, were constructed.

- *Geographical distance* was categorized as 0) live within 20 km, and 1) live more than 20 km apart. The cut-off at 20 km was chosen because a geographical distance of more than 20 km has been associated with less face-to-face contact between older adults and offspring (Fors & Lennartsson, 2008).
- *Contact frequency* between older adults and adult offspring was based on spending time and/or having telephone contact and categorized as 0) weekly and 1) less than weekly.

For the analyses of social mobility of the offspring, the variable *Intergenerational social class mobility* of offspring was created based on a combination of the older adults' and the offspring's social class. *Intergenerational social class mobility* was categorized as 0) stable non-manual occupation, 1) upward mobility, 2) downward mobility and 3) stable manual occupation.

2.1.3. Outcomes

A PF index based on the ability to walking 100 m briskly without difficulties and climb up and down stairs without difficulties was constructed (Agahi, Kelfve, & Lennartsson, 2016). The index was categorized as 0) not able to walk 100 m and climb the stairs without difficulties, 1) only able to either walk 100 m or climb the stairs without difficulties, 2) able to both walk 100 m and climb the stairs without difficulties. The index was treated as a linear outcome with the values 0–2, thus we assume that the index represents an underlying continuous scale of PF.

2.2. Analyses

Linear regression models were used to analyze the associations between offspring's social class and their parents' PF. The available data were weighted with the inverse probability of not being missing to adjust for the 133 individuals excluded due to missing values. These probabilities were estimated in a logistic regression model with all the co-variables as explanatory variables. We tested whether the associations between the offspring's social class and their parent's PF differed between strata of geographical distance and contact frequency in additional analyses by including corresponding interaction terms in the models. Observations were not independent because some participants (initial study sample: N = 200, final study population: N = 154) were included both in 2002 and 2011 with updated information on all variables. Since 154 participants were included both in 2002 and 2011, the artificially inflated confidence due to repeated observations on the same participants was corrected by the use of a robust sandwich estimator for the variance using Stata's (13) cluster command. All analyses were also adjusted for survey year. Finally, interaction between offspring social class and survey year (2002 and 2011) for the outcome of PF was insignificant (p-value: 0.8), thus the analyses were not stratified by survey year.

3. Results

The baseline characteristics of the study population are presented in Table 1. The mean PF was 1.1 (0.03) on the scale from 0–2. In Appendix, Table S2 shows that the distribution of the baseline characteristics was overall similar for the two waves of data with the exception that the population in the 2011 wave was older, more often had prior non-manual occupation and more often had offspring with non-

Table 1
Population characteristics in the 2002 and 2011 SWEOLD data, N (%).

All		1186 (100.0)
Older adults' age	76-79 years	272 (22.9)
	80-84 years	380 (32.0)
	85-89 years	233 (19.7)
	90+ years	301 (25.4)
Older adults' gender	Females	678 (57.2)
	Males	508 (42.8)
Older adults' social class	Non-Manual	702 (59.2)
	Manuel	484 (40.8)
Older adults' physical function index	Mean (SD)	1.10 (0.03)
Adult offspring's social class	Non-Manuel	1016 (85.7)
	Manuel	170 (14.3)
Contact frequency with adult offspring	High	989 (83.4)
	Low	197 (16.6)
Adult offspring's gender	Male	573 (48.3)
	Female	613 (51.7)
Adult offspring's age	Mean (SD)	55.2 (0.25)
Geographic distance to offspring	0-20 km	600 (50.6)
	> 20 km	586 (49.4)

Table 2
Estimates of physical function associated with offspring social class from separate Linear regression analyses among 1186 older adults.

		Mean difference in physical function (CI95%)	
	Cases	Unadjusted	Adjusted (own and partner social class, offspring age and gender)
Offspring social class			
Non-manual	555 (54.6)	0.00	0.00
Manual	115 (67.6)	−0.22 (−0.36; −0.08)	−0.14 (−0.28;0.00)

manual occupation. Table 2 shows that the proportion with limited PF (a score of 0–1 on the PF index) was greater among older adults with offspring with manual occupation (67.6%) compared to older adults with offspring with non-manual occupation (54.6%).

Table 2 shows unadjusted and adjusted estimates and 95% confidence intervals (CI 95%) for the associations between offspring's social class from linear regression analyses. The unadjusted analyses showed that older adults with offspring with manual occupation had 0.22 (CI95%: −0.36; −0.08) point poorer PF than older adults with offspring with non-manual occupation. The association was still adverse, but the CI95% included the reference value of 0.00 after adjustment for potential confounders (−0.14 (CI95%: −0.28; 0.00)).

Table 3 shows the effect-measure modification of older adults' geographical distance to and contact frequency with offspring on associations between adult offspring's social class and older adults' PF. In the adjusted analyses, older adults with short geographical distance to their offspring had poorer PF (−0.22 (CI95%: −0.39;-0.05)) when their offspring had manual compared to non-manual occupation. However, test of interaction was insignificant (p = 0.08). There were no differences in estimates between older adults who had low or high contact frequency with offspring.

Fig. 2 shows adjusted associations between intergenerational social mobility of offspring and older adults' PF. Compared to the reference of stable non-manual occupation, the estimates showed that especially older adults with downwardly mobile offspring (−0.33 (CI95%: −0.54; −0.12)) were associated with poorer PF. However, also upward mobility (−0.18 (CI95%: −0.29; −0.07)) and stable manual occupation were associated with poorer PF (−0.18 (CI95%: −0.35; −0.00)). Pairwise combination showed no differences between older adults with offspring with upward mobility, downward mobility or stable manual occupation.

3.1. Supplementary analyses

A supplementary analysis of decline in PF from 2002 to 2004 and 2011–2014 restricted to older adults with full PF (n = 397) overall

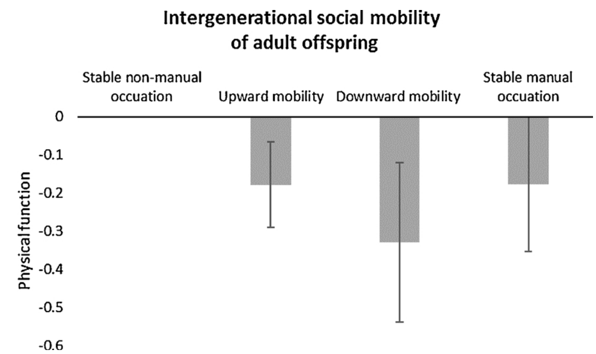

Fig. 2. Physical function associated with social mobility of adult offspring's social class from separate linear regression analyses based on 1186 older adults.

supported the main findings (Appendix, Table S3). The second supplementary analysis included offspring's social class in six categories. The results showed that compared to older adults with offspring with upper white collar occupation, older adults with offspring with unskilled occupation (−0.24 (CI95%: −0.43; −0.06) were associated with the poorest PF (Appendix, Table S4). This could indicate that the main results (Table 2) to some degree were driven by differences between those with the lowest and highest occupations. Also, many older adults have more than one offspring and there are therefore several approaches to investigate the association between offspring's SEP and older adults' health outcomes. We applied two additional approaches by the 'average' and 'closest' offspring approach (Appendix, Table S5). The 'average' approach analysis was based on a combination of all offspring. This analysis showed that compared to the reference of older adults for whom all offspring had non-manual occupation, older adults for whom all offspring had manual occupation were associated with poorer PF. Older adults with offspring with mixed social classes were also associated with poorer PF, however the CI95% included the reference. The 'closest' offspring approach was based on the oldest offspring who the older adults felt closest to. The analysis showed findings overall similar to the main results. Finally, older adults may move closer to offspring when experiencing decline in PF. We investigated this among the 154 older adults included both in the 2002 and 2011 waves (Appendix, Table S6). The majority (83.5%) did not experience change in the geographical distance to offspring between the two waves, but 6.6% experience an increase and 9.9% experience a decrease in the geographical distance. Unadjusted analyses showed no statistically significant association between change in geographical distance to offspring and change in physical function.

Table 3
Physical function associated with adult offspring's social class within characteristics of older adults and their relationship with their offspring from separate Linear regression analyses based on 'dominance' approach analyses (N = 1186).

		Mean difference in physical function (CI95%)			Mean difference in physical function (CI95%)		P-value for interaction	
Offspring social class	Cases	Unadjusted	Adjusted	Cases	Unadjusted	Adjusted	Unadjusted	Adjusted
	Low contact frequency with offspring			**High contact frequency with offspring**				
Non-manual	104 (60.8)	0.00	0.00	451 (53.4)	0.00	0.00		
Manual	19 (73.1)	**−0.23 (−0.56; −0.11)**	−0.11 (−0.46; 0.24)	96 (66.7)	**−0.22 (−0.37; −0.06)**	−0.15 (−0.30;0.01)	0.95	0.85
	Long geographical distance to offspring			**Short geographical distance to offspring**				
Non-manual	281 (53.3)	0.00	0.00	274 (56.0)	0.00	0.00		
Manual	33 (55.0)	−0.04 (−0.28; 0.20)	0.03 (−0.21;0.27)	82 (74.6)	**−0.30 (−0. 47; −0.13)**	**−0.22 (−0.39; −0.05)**	**0.08**	**0.08**

4. Discussion

4.1. Offspring socioeconomic position and older adults' health

The results showed that older adults whose offspring had manual occupations had poorer PF, on average, than older adults whose offspring had non-manual occupations. Two previous cross-sectional studies have shown that having offspring with high SEP, measured by education and financial status, was associated with better PF among older adults. First, a study of 3795 older adults (aged 60 years or older) in Taiwan showed an adverse gradient in the association between level of the highest educated offspring and the presence and severity of physical limitations. The analyses were adjusted for parents' own education, income and the wealth of the household (Zimmer et al., 2002). Second, a study of 9661 Mexicans aged 50 years and older showed that, compared to older adults for whom all offspring had less than 12 years of education (equal to high school), older adults whose every offspring had minimum 12 years of education had fewer functional limitations. However, there was no health advantage among the older adults who had offspring both with and without 12 years of education. The study also investigated the impact of offspring's financial status and found similar results. The analyses were adjusted for parents' own education, but not partner's education (Yahirun et al., 2016). Thus the estimates might be confounded by household socioeconomic resources. In the current study, the associations between offspring social class and older adults' PF were based on a high-income context in Sweden, but similar associations have also previously been detected in middle and low income countries, such as Mexico and Taiwan. The associations were stronger in Mexico and Taiwan [12 13] compared to Sweden, which could indicate that the impact of social foreground depends on cultural norms, family patterns and the degree of social support in the countries. Social foreground may be less important in a Nordic context with high social security based on the welfare state and a universal healthcare system (Magnussen & Saltman, 2009), i.e. in a setting where older adults may be less financially dependent on adult offspring in old age. However, it is important to note that offspring are important sources of social contact for older adults also in Sweden. In our study population, 75–80% had contact with their offspring every week (Table 1). Overall, the results from the present and previous studies imply that the impact of social foreground on health in old age exists in both high, middle and low income countries, though the reasons and degree of influence may vary between countries. The majority of previous studies on the impact of offspring' socioeconomic factors on older adults' health have analyzed mortality. The five previous studies from Sweden, USA, South Africa, Taiwan and China (N = 3,707–832,762) observed associations between higher education of offspring and lower mortality of older adults (Torssander, 2013, 2014; Zimmer et al., 2002). The study by Torssander (2014) furthermore investigated the association between three measures of adult offspring's SEP by education, income and social class and older adults' mortality in Sweden. All three measures were adversely associated with older adults' mortality, yet the associations were greatest for education (Torssander, 2014).

4.2. Geographical and social closeness as potential effect-measure modifiers

We found that the magnitudes of the associations were greater when older adults lived close to the offspring, however the test of statistical interaction between offspring's social class and geographical distance was only significant at the 10% level. The aforementioned Taiwanese study found that the severity of physical limitations was greater when the offspring both had low education and lived far away, compared to any other combination of the two variables (test of interaction not reported) (Zimmer et al., 2002). The associations did not differ depending on whether the older adults had low and high contact with the offspring. No previous studies have investigated social contact as effect-measure modifiers of the association between offspring SEP and the health of their older parents. Lack of statistical power may explain the insignificant interaction analyses between offspring SEP, geographical closeness, and contact frequency, respectively. Geographical closeness and contact frequency may both facilitate transfer of resources related to the social class of the offspring, but at the same time, compensate for lack of resources related to a lower social classes level of the offspring.

4.3. Intergenerational social mobility

The study found support for the importance of intergenerational social mobility of offspring for the PF of their older parents. Older adults with offspring that experienced downward mobility had the poorest PF. Older adults with offspring who was upwardly mobile or had stable manual social class also had poorer PF than those whose offspring was not socially mobile (stable non-manual occupation), yet this may partly be driven by the older adults' own prior occupation. The results that downward mobility was associated with the poorest PF could be explained by the possibility that older adults experience a status loss when offspring do not obtain the same social class as themselves. The results for upward mobility may be explained by older adults with higher SEP more easily adopt to new conditions and behaviors and thereby are able to take more advantage of the resources related to offspring with high SEP (Friedman & Mare, 2014). Thus, poorer PF among older adults whose offspring experience upward mobility may be explained by especially beneficial effects for the reference groups of older adults with prior non-manual occupation whose offspring also have non-manual occupation (stable non-manual occupation). Furthermore, the act of upward social mobility of adult offspring may impact the generations' relationship negatively. As described in Simandan (2018), upward social mobility among individuals from disadvantaged backgrounds can result in social isolation and negative relations with individuals from their prior SEP (Simandan, 2018). Hence, lack of support and connection with offspring could explain the findings of poorer PF among older adults whose offspring had experienced upward mobility. In the Mexican study of PF, offspring's level of education only added to the impact of the older adults' educational level (no interaction) (Yahirun et al., 2016). Studies on mortality have found conflicting results. The American study found no interaction (Friedman & Mare, 2014), whereas the Chinese study showed that low educational level of adult offspring was associated with greater mortality when fathers had high compared to low educational level (Yang et al., 2016). In contrast the Taiwanese study showed that survival of older adults' with middle or high education benefited most from having highly educated offspring (Zimmer et al., 2007). Diversity in the findings may be explained by different cultural and societal settings. Given the limited number of studies, intergenerational social mobility still needs to be investigated in relation to the concept of social foreground.

4.4. Correlation and causality

As also mentioned in previous studies, the observed associations between offspring's SEP and the older adults' health may not necessarily express a causal relationship. The associations could be confounded by unmeasured factors such as the older adults' cognitive ability in midlife and personality traits that favor long-term investment, which are factors that influence education and later SEP of offspring and the older adults' own health [6 12]. We adjusted for the parental and parental partners' prior social class to account for this. Two previous studies have furthermore tried to account for unmeasured confounders. First, a study by Torssander (2013) addressed unmeasured confounders by using fixed-effects models where parental siblings were compared to adjust for shared and unmeasured familial background. In these analyses with adjustments for all potential unmeasured confounders related to familial background, significant association between higher educational level of adult offspring and lower mortality of older adults was detected (Torssander, 2013). Hence, the previous study by Torssander (2013) provides evidence that the associations between social foreground and older adults' mortality could express a causal relationship. Second, Lundborg and Majlesi (2015) used an instrumental variable design to account for confounding. The study used the gradual implementation of increase in number of mandatory years of schooling from seven to nine years in Sweden during the period 1949-1962 as an instrument for differences in offspring's education. The study found no association with older adults' mortality with the exception of a sub-analysis that showed adverse association between son's education and mother's survival (Lundborg & Majlesi, 2015). This could imply that the impact of adult offspring's education on older adults' survival only apply when comparing greater educational differences and not two additional years of elementary school. These results do not necessarily suggest that there is no causal effect of offspring's education on older adults' health; the results merely suggest that a potential positive influence of education on health only apply at higher levels than elementary school. More studies should seek to use quasi-experimental designs to further disentangle the causal relationship between offspring SEP and older adults health. Finally, given the cross-sectional nature of the study, the detected associations may express reverse causality. There is a possibility that older adults who had poorer PF have had this throughout their lives which, in turn, may have influenced their offspring's socioeconomic opportunities. This could be the explanation for the associations detected for downward social mobility. Older adults who have had poorer health throughout their lives may have been less able to support their offspring in obtaining the same level of SEP. Applying a long-term follow-up design would limit the risk of reverse causality. However, we believe that the risk of reverse causality is minor as decline in PF function generally does not occur until middle and old age, where most offspring would have already obtained their adult SEP.

4.5. Strengths and limitations

A major strength of this study is the extensive information about the study population and relationship with adult offspring, which enables multiple approaches to define the exposure of offspring's social class in the main and supplementary analyses. The high participation rate of 84.4% in 2002 and 86.2% in 2011 and inverse probability weighting of those excluded due to missing values decrease the risk of selection bias. The information is obtained from face-to-face interviews, which improves the validity of the measures included in the study. There are also some limitations to acknowledge. Even though the study population comprised 1186 older adults, a larger sample size would improve the statistical power and thereby allow for stronger conclusions. The observational nature of the study makes it impossible to draw conclusions about the causal nature of the associations. As noted, associations of offspring's SEP and parent's health could be confounded by unmeasured characteristics e.g. cognitive ability as described earlier. We tried to minimize this potential bias by adjusting for own and partners' previous social class. Also, the cross sectional design of the analyses of PF could further reduce the potential for causal inference. But this may be less of a problem for adult offspring's social class, as most offspring probably enter the workforce before their parents reach old age where most PF limitations emerge. Also, social causation is to some degree supported by the supplementary analyses of decline in PF showing similar results (Appendix, Table S3). The cross-sectional nature of the study may also be important for the interpretation of the influence of geographical distance. It is likely that older adults and offspring move closer when the older adult experience limitations in physical function. A supplementary analysis showed that there was a tendency, however insignificant, that older adults who experienced a decrease in geographical distance to offspring were associated with decline in physical function compared to the stable reference (Appendix, Table S6). However, it is important to highlight that the main results (Table 2) only show the potential effect-measure modification of geographical distance on the associations between offspring social class and physical function of older adults, thus not the direct effect-measures associated with geographical distance. Finally, especially information regarding the social class of offspring may be subject to misclassification as it is based on the older adults' perception and memory. However, the misclassification is likely to be reduced when dichotomizing the variable in the broad categories social class. On the other hand, the broad categories yield substantial unmeasured socioeconomic heterogeneity that may lead to underestimations of the associations.

4.6. Implications and future studies

Evidence of the impact of social foreground implies that socioeconomic resources available in older adults' close family relations are important for their PF and health. The results on intergenerational social mobility could imply that the dynamics and interplay between generations influence whether social foreground is important for older adults' health. Preventive interventions and healthcare professionals that focus on socioeconomic inequality in health in old age should not only focus on the older adults' own SEP, but also have attention to the socioeconomic resources in the older adults close network. Furthermore, it is important to pay attention to the dynamics of older adults' family relations and the amount of support that older adults receive from their offspring.

This study contributes with new results, strengthening the evidence of the impact of social foreground on older adults' health. However, additional studies are needed. The validity of the results from the present study is limited by the observational and cross-sectional study design. Future studies should seek to apply long-term follow-up designs to limit the risk of reverse causality, and furthermore apply methods that more sufficiently account for residual confounding, such as natural experiments, instrumental variables and fixed-effects analyses.

5. Conclusion

Older adults whose offspring had manual occupation had poorer PF, on average, than older adults whose offspring had non-manual occupation. In stratified analyses of older adults with short and long geographical distance to their offspring, offspring with manual occupation was only associated with poorer PF among older adults who lived geographically close to the offspring. The associations did not differ between groups of older adults with low and high contact frequency with offspring. This study adds to the current evidence on social foreground, and indicates that it is the possibility to draw on resources related to the social class of adult offspring, when needed, rather than regular transfers of resources that drives the association between social foreground and health in later life. The study furthermore provides knowledge on how intergenerational social mobility seems to shape the associations between social foreground and PF of older adults. Compared to older adults whose offspring had stable intergenerational non-manual occupation, older adults with offspring who experienced downward intergenerational social mobility had the poorest PF on average. However, older adults with offspring who experienced upward intergenerational social mobility also experienced poorer PF on average.

Conflict of interest

None declared

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.archger.2018.10.006.

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